

# Taphozous hildegardeae.

By Elizabeth Colket and Don E. Wilson

Published 4 December 1998 by the American Society of Mammalogists

## *Taphozous* É. Geoffroy St.-Hilaire, 1818

*Taphozous* É. Geoffroy St.-Hilaire, 1818:113. Type species *Taphozous perforatus* É. Geoffroy St.-Hilaire, 1818, by monotypy. *Liponycteris* Thomas, 1922:267. Type species *Taphozous nudiventris* Cretzschmar, 1830, by original designation (valid as a subgenus).

**CONTEXT AND CONTENT.** Order Chiroptera, Suborder Microchiroptera, Superfamily Emballonuroidea, Family Emballonuridae, Subfamily Taphozoinae, Tribe Taphozoini (Robbins and Sarich, 1988). The genus *Taphozous* contains two subgenera and 13 species. Although Koopman's (1993) earlier list included *T. philippensis* as a separate species, his (1994) more recent summary listed it as a subspecies of *T. melanopogon*. A key to subgenera and species (modified from Koopman, 1994) follows:

1	Frontal region of skull only weakly concave. Rump and pygal areas at least partly naked. Occipital "helmet" on skull more or less developed . . . . .	Subgenus <i>Liponycteris</i>	2	
	Frontal region of skull strongly concave. Rump and pygal areas well-haired. No occipital "helmet" on skull . . . . .		Subgenus <i>Taphozous</i>	3
2	Small (forearm length, 61–69 mm). A slight but definite concavity in the frontal region. Hairless rump and pygal areas relatively small. Occipital "helmet" of skull poorly developed . . . . .	<i>T. hamiltoni</i>		
	Larger (forearm length, 66–79 mm). Frontal concavity virtually absent. Hairless rump and pygal areas relatively large. Occipital "helmet" well developed . . . . .	<i>T. nudiventris</i>		
3	Gular sac present . . . . .	4		
	Gular sac absent . . . . .	8		
4	Distinctive color pattern, grizzled gray dorsally and white ventrally . . . . .	<i>T. mauritianus</i>		
	Color uniform dorsally and only slightly paler, if at all, ventrally . . . . .		5	
5	Basisphenoid pits broad . . . . .	6		
	Basisphenoid pits narrow or medium in width . . . . .	7		
6	Size medium (forearm length, 63–67 mm). Anterior ventral mandibular emargination strong. Australia and New Guinea . . . . .	<i>T. australis</i>		
	Size relatively small (forearm length, 55–62 mm). Anterior ventral mandibular emargination weak. SE Asia . . . . .		<i>T. longimanus</i>	
7	Size larger (forearm length, 63–72 mm). Anterior ventral mandibular emargination strong . . . . .	<i>T. hilli</i>		
	Size smaller (forearm length, 58–63 mm). Anterior ventral mandibular emargination weak . . . . .	<i>T. kapalgensis</i>		
8	Blackish or reddish beard-like throat patch variably developed in males . . . . .	9		
	No differentiated throat patch present . . . . .	11		
9	Size relatively large (forearm length, 69–73 mm) . . . . .		<i>T. theobaldi</i>	
	Size medium (forearm length, 60–70 mm) . . . . .	10		
10	Braincase relatively broad. Fur relatively pale in color. Africa . . . . .		<i>T. hildegardeae</i>	
	Braincase relatively slender. Fur relatively dark in color. SE Asia . . . . .		<i>T. melanopogon</i>	
11	Size relatively large (forearm length, 70–75 mm) . . . . .		<i>T. troughtoni</i>	
	Size medium (forearm length, 57–71 mm) . . . . .	12		
12	Smaller (forearm length, 57–67 mm), ears relatively short (17–20 mm). Africa and Asia . . . . .		<i>T. perforatus</i>	
	Larger (forearm length, 64–71 mm), ears longer (21–22 mm). Australia . . . . .		<i>T. georgianus</i>	

## *Taphozous hildegardeae*, Thomas, 1909

Hildegarde's Tomb Bat

*Taphozous hildegardeae* Thomas, 1909:98. Type locality "Mombasa district, Rabai, 700', Kenya."

**CONTEXT AND CONTENT.** Context same as for genus. No subspecies are recognized.

**DIAGNOSIS.** *T. hildegardeae* (Fig. 1) is an African representative of the Asiatic black-bearded *T. melanopogon*, not known west of India (Thomas, 1909). Adult male *T. hildegardeae* possess a distinctive black throat beard, a character otherwise unknown in African species. *T. hildegardeae* can be differentiated from the African *Taphozous* species (*hamiltoni* and *nudiventris*) belonging to the subgenus *Liponycteris* by the fact that its rump and pygal areas are well furred, as opposed to being naked. *T. hildegardeae* can be differentiated from the African *T. perforatus* by possession of the beard in males (which male *T. perforatus* lack) and by a generally overall larger size. *T. hildegardeae* can be differentiated from the African *T. mauritianus* by complete absence of the gular sac (present in *T. mauritianus*) and the black beard (a naked region in *T. mauritianus*). *T. hildegardeae* can be differentiated from African *Saccopteryx* by the much smaller size and by the presence of a radiometacarpal pouch in the wing (at most poorly developed and usually absent in all *Saccopteryx*).

Kingdon (1974) suggested that *T. hildegardeae* may be a relic species of an Indian *Taphozous*, presumably *T. melanopogon*. Both species have similar ears, feet, and tail, but the skull (Fig. 2) of *T. hildegardeae* is larger and the brain case is broader. *T. hildegardeae* can best be distinguished from *T. melanopogon* by its larger size, larger extension over the throat of the black beard, and broader skull (Thomas, 1909), as well as by its pale color, white wings, and a larger skull in males than in females. *T. hildegardeae* is unique in comparison to *T. perforatus*, *mauritianus*, *melanopogon*, *longimanus*, and *theobaldi* in having a distinctly larger skull in males than in females (Thomas, 1915).

**GENERAL CHARACTERS.** The genus *Taphozous* can be easily separated from *Saccopteryx* and various other bats by the combination of having the ventral side of the dentary usually concave, and the tympanic bullae incomplete medially and separated from the basioccipital. *T. hildegardeae* is characterized by its radiometacarpal pouch and lack of a gular sac in both sexes. The lower lip has a small groove. Males have a distinct blackish beard that covers the under-surface of the throat. The dorsal surface of *T. hildegardeae* is pale brown. The bases of hairs are white and the



FIG. 1. *Taphozous hildegardeae* from cave near Mombassa, Kenya.

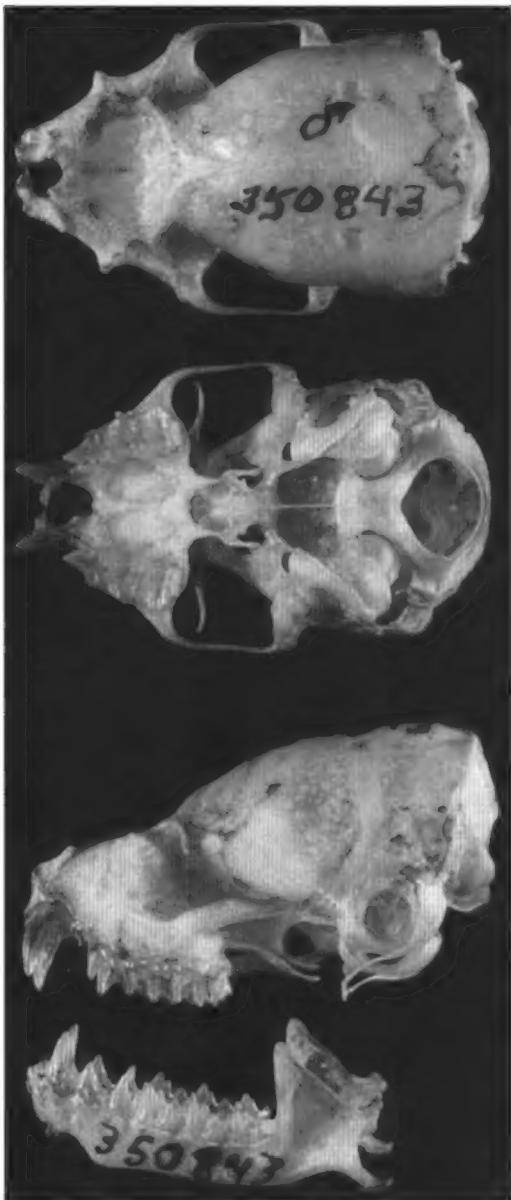


FIG. 2. Dorsal, ventral, and lateral views of skull and lateral view of mandible of an adult *Taphozous hildegardeae* from Vipingo Cave, Kenya (male, USNM no. 350843). Greatest length of skull is 19.75 mm.

tips are chocolate-brown. Hair of lips and chin anterior to the beard is pale brown. Hair of the belly is white, with a few brown-tipped hairs. Limbs, as well as the dorsal side of antebrachial, interfemoral, and wing membranes near the body, are all brown. Distal part of the wing membrane, ventral side of the membranes, and fur on the membrane on both sides of the body are all white (Thomas, 1915). Profile of the forehead is concave (Koopman, 1975).

Ranges of external ( $n = 5$  males, 5 females, respectively) and cranial ( $n = 2$  males, 3 females, respectively) measurements (in mm) of specimens in the collections of the National Museum of Natural History, are as follows: total length, 104–110 and 105–109; tail length, 25–28 and 25–29; hindfoot length, 11–12 and 12–13; ear length, 20–21 and 18–21; tragus length, 6–7 and 5–8; forearm length, 63–66 and 63–65; greatest length of skull, 19.7–19.8 and 19.4–19.5; breadth of brain case, 9.70–9.73 and 9.55–9.80; least interorbital breadth, 6.20–6.38 and 6.10–6.14; zygomatic breadth, 12.55–12.60 and 12.35–12.50; maxillary toothrow length, 6.75–6.80 and 6.45–6.70.

Kingdon (1974) gave body mass of *T. hildegardeae* as 20–27 g. According to McWilliam (1988), mean body mass of males seasonally ranges between 24 and 36 g. Mean body mass of females, with

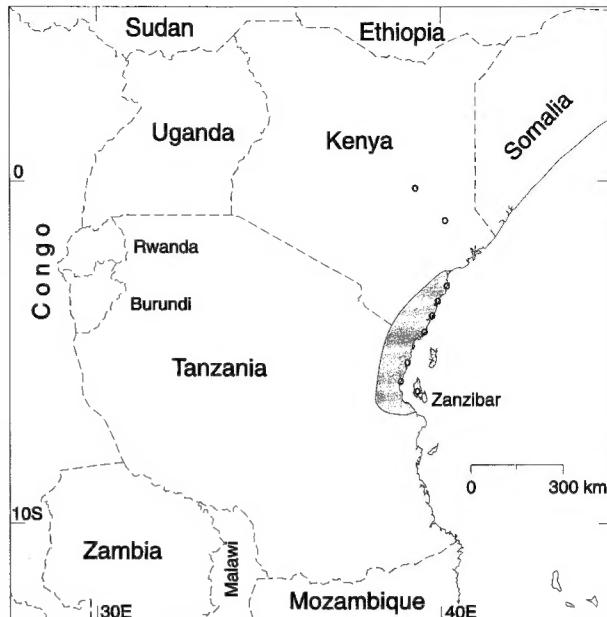


FIG. 3. Distribution of *Taphozous hildegardeae* in East Africa. Individual collecting localities are represented by dots.

the exception of pregnant individuals, does not exhibit pronounced fluctuations.

**DISTRIBUTION.** Thomas (1909) recorded *T. hildegardeae* from Mombasa district in coastal Kenya both at Rabai at 214 m altitude and at Shimoni at sea level (Fig. 3). This tomb bat forms colonies within the coral caves along the eastern coast of East Africa (Kingdon, 1974), where it can be found throughout the year. It has also been reported along the Kenyan coast at Ngombeni (Kulzer, 1959), Kolidini (or Kilindini), Ukunda, Tiwi, Ngomeni (Kock, 1974), Shimoni, Moto Cave, and Vipingo Cave. The distribution also includes central Kenya, NE Tanzania, and Zanzibar (Koopman, 1993; Nowak, 1994). However, the two records of *T. hildegardeae* from central Kenya are based on Harrison's (1962) identification of *T. hildegardeae* at Chandler's Falls and Massabuku. Kock (1974) questioned these localities as they are the only known records of *T. hildegardeae* that are not along the East African coast. He suggested that the specimens should be re-examined as the localities are within the known range and habitat of the closely related species, *T. perforatus*. No fossils are known.

**FORM AND FUNCTION.** Bimodal weight cycle of males is associated with deposition of fat that occurs during the rainy seasons due to increased food supply. The fat is later used to sustain competitive mating and as a reserve during the dry season. With the exception of pregnancy, females show less fluctuation in their body weight cycles because of the absence of fat depositions for use in competitive mating and due to energy needs of lactation (McWilliam, 1982).

**ONTOGENY AND REPRODUCTION.** *T. hildegardeae* has a reproductive cycle that coincides with annual fluctuations in the food supply in coastal Kenya. Females are monoestrous and give birth in December (McWilliam, 1982). Two periods of sexual activity correspond to increase in body weight of males and increased territoriality and are characterized by an increase in weight of paired Cowper's glands of males from 11 to 15 mg and of the accessory gland complex of males from 15 to 45 mg (McWilliam, 1988). The principal period of sexual activity occurs during the long rains (April–June) and usually results in mating. The secondary period of sexual activity occurs during the short rains (November–December) and usually does not result in mating. The secondary period of sexual activity, corresponding to the energy-demanding stages of late pregnancy and early lactation, is used to maintain year-round territories and harems. McWilliam (1988) suggested that the secondary period of sexual regeneration might be retained from a vestigial, polyestrous, reproductive cycle. The less energy-demanding stages of pregnancy take place during the long dry season

(July–October). Late implantation of the blastocyst in the oviduct has been associated with severe dry seasons when adult females are in poor body condition (McWilliam, 1982).

**ECOLOGY.** Large colonies of *T. hildegardae* maintain diurnal roosts (McWilliam, 1982) in more open regions (Fenton, 1985; Kingdon, 1974) or Pleistocene coral caves (McWilliam, 1988). *T. hildegardae* often cohabit with *Coleura afra*, which occupy the lighter, more open parts of caves. *Triaenops persicus* and *Hipposideros caffer* often roost in deeper sections of the same caves (Kingdon, 1974). Migrations are not known (McWilliam, 1982), although local movements may occur (Kock, 1974).

*Taphozous hildegardae* feeds on Orthoptera and Lepidoptera (McWilliam, 1988). No endoparasites of *T. hildegardae* are known. Primary ectoparasites are the cimicid bug, *Loxaspis miranda* (Kock, 1974; Rothschild, 1912; Usinger, 1966), and the bat-parasitizing fly, *Brachytarsina alluaudi* (Falcoz, 1923; Kock, 1974). Predation on *T. hildegardae* has not been documented.

**BEHAVIOR.** *Taphozous hildegardae* is gregarious (Nowak, 1994) and the roosts are partitioned socially. The mating system entails harem polygyny and the males maintain territories in caves throughout the year (McWilliam, 1988). Juvenile bats and territorial 'bachelor' males have specific roosting areas. Some roosting sites are maintained throughout the year by dominant males and their harem of females or by multi-male groups with a larger harem of females (McWilliam, 1982). Territorial males with a large group of females and young will herd the group tightly together (Fenton, 1985).

Adult males remain at distances from other adult males greater than the striking range of an extended forearm. If an adult male is approached by another bat, he will extend his head and body and sniff the other bat. When the other bat is a female, the adult male will commence sniffing her anogenital area. When the other bat is a male, the adult male will show aggression by using wing-flicks, vocalizations, scent-marking, visual displays, posture changes, and attacks. Wing-flicks comprise stretching the forearm away from the body to create a rapid vibration of the folded end of the phalanx and the long third digit. Vocalizations of *T. hildegardae* in response to territorial behavior or to danger are audible to the human ear and have been characterized as "tcheek tcheek." Territorial scent-marking involves pressing the anogenital area to the substrate or using exudate from throat glands on the substrate. Adult males mark females living in their territories by rubbing their throat glands over the backs of the females. Adult males mark themselves by rubbing their forearms and folded wings over their throat glands (Fenton, 1985).

Nothing is known about echolocation in this species.

**REMARKS.** The local name of *T. hildegardae* is "white-winged bat" (Rothschild, 1912). *Taphozous* is from Greek roots meaning "grave or tomb living," a reference to the fact that great numbers of these bats were found living in tombs by the French expedition that collected the type during explorations in Egypt at the beginning of the 19th century. The specific epithet, *hildegardae*, was coined by Oldfield Thomas in honor of Hildegarde Hinde, wife of the collector of the holotype.

## LITERATURE CITED

FALCOZ, L. 1923. Biospeologica XLIX Pupipara (Diptères) (Première Série). Archives de zoologie expérimentale et générale, Paris, 61:521–552.

FENTON, M. B. 1985. Communication in the chiroptera. Indiana University Press, Bloomington, 161 pp.

GEOFFROY ST.-HILAIRE, É. 1818. Description de l'Egypte. Histoire naturelle. Description des mammifères qui se trouvent en Egypte, 2:99–135.

HARRISON, D. L. 1962. A check-list of the bats (Chiroptera) of Kenya Colony. Journal of the East Africa Natural History Society, 23:286–295.

KINGDON, J. 1974. East African mammals: an atlas of evolution in Africa. University of Chicago Press, Chicago, 2A:1–341.

KOCK, D. 1974. Hildegarde's tomb bat *Taphozous hildegardae* Thomas, 1909: first record from Tanzania. East African Natural History Society Bulletin, Nairobi, May:70–71.

KOOPMAN, K. F. 1975. Bats of the Sudan. Bulletin of the American Museum Natural History, New York, 154:355–443.

—. 1993. Order Chiroptera. Pp. 137–241, in Mammal species of the world: a taxonomic and geographic reference. Second ed. (D. E. Wilson and D. M. Reeder, eds.). Smithsonian Institution Press, Washington, District of Columbia, 1206 pp.

—. 1994. Chiroptera: Systematics. Handbuch der Zoologie: Mammalia, Part 60, Walter de Gruyter, New York, 8:1–217.

KULZER, E. 1959. Fleidermäuse aus Ostafrika. Zoologische Jahrbücher, 87:14–41.

MCWILLIAM, A. N. 1982. Adaptive responses to seasonality in four species of microchiroptera in coastal Kenya. Ph.D. dissertation, University of Aberdeen. Aberdeen, U. K.

—. 1988. The reproductive cycle of male tomb bats, *Taphozous hildegardae* (Chiroptera: Emballonuridae), in a seasonal environment of the African tropics. Journal of Zoology (London), 215:433–442.

NOWAK, R. M. 1994. Walker's mammals of the world. Fifth ed. The Johns Hopkins University Press, Baltimore, Maryland, 1: 1–642.

ROBBINS, L. W., AND V. M. SARICH. 1988. Evolutionary relationships in the family Emballonuridae (Chiroptera). Journal of Mammalogy, 69:1–13.

ROTHSCHILD, N. C. 1912. On a new genus and species of Clinocoridae (Cimicidae) from Uganda. Bulletin of Entomological Research, London, 1:363–364.

THOMAS, O. 1909. New African small mammals in the British Museum Collection. Annals and Magazine of Natural History, London, series 8, 4:98–112.

—. 1915. Notes on *Taphozous* and *Saccoaimus*. The Journal of the Bombay Natural History Society, Bombay, 24:57–63.

—. 1922. The generic classification of the *Taphozous* group. Annals and Magazine of Natural History (ser. 9) 9:266–267.

USINGER, R. L. 1966. Monograph of Cimicidae (Hemiptera-Heteroptera). The Thomas Say Foundation, 7:1–585.

Editors of this account were ELAINE ANDERSON AND VIRGINIA HAYSEN. Managing editor was BARBARA H. BLAKE.

ELIZABETH COLKET AND DON E. WILSON, NATIONAL MUSEUM OF NATURAL HISTORY, SMITHSONIAN INSTITUTION, WASHINGTON, D.C., 20560.